Practice Patterns of Hepatobiliary Surgery Within the Military

CPT Camille R. Suydam, MD[1]; CPT Marcos C. Aranda, MD[1]; CPT Thomas A. O'Hara, DO[1]; CPT Fred C. Kobylarz, MD[1]; CPT Joy N. Liang, MD[1]; LTC Bradley Bandera, MD[1]

[1]Department of General Surgery

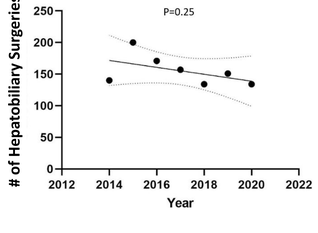
Dwight D Eisenhower Army Medical Center, Fort Gordon, GA 30907

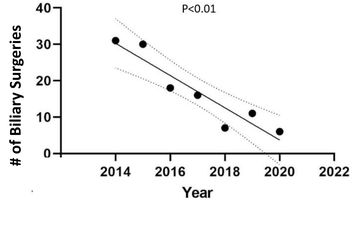
Background: The purpose of this study is to evaluate the trends of hepatobiliary surgeries performed at military hospitals and to discuss potential implications on resident training and military readiness. There is data to suggest centralization of surgical specialty services leads to improved patient outcomes, the military does not currently have a specific centralization policy. Implementation of such a policy could potentially impact resident training and readiness of military surgeons.

Methods: This study is a retrospective review of de-identified data from Military Health System Mart (M2) from 2014 to 2020. The M2 database contains patient data from all Defense Health Agency (DHA) treatment facilities, encompassing all branches of the United States Military. Variables collected include number and types of hepatobiliary procedures performed and patient demographics. Cholecystectomies, percutaneous procedures, and endoscopic procedures were excluded. The primary endpoint was the number and type of surgery for each medical facility. Further sub-analysis was performed using linear regression to compare the number of hepatobiliary surgeries performed by each branch of service (Army, Navy, and Air Force); the total number of surgeries performed at the four highest volume centers (Naval Medical Center Portsmouth, Madigan Army Medical Center, Brooke Army Medical Center, and Walter Reed National Military Medical Center); the total number of hepatic surgeries (CPT codes 47010-47400); and the total number biliary surgeries (47420-47999).

Results: Fifty-five military hospitals performed hepatobiliary surgeries from 2014 to 2020. A total of 1,087 hepatobiliary surgeries were performed during this time. There was no significant decrease in overall number of hepatobiliary surgeries. The most commonly performed hepatobiliary surgery was "unlisted laparoscopic liver procedure". The military training facility with the most hepatobiliary cases was Brooke Army Medical Center. On sub-analysis by branch of service, there was no significant decrease in the number of surgeries performed in the Army (p=0.84), Navy (p=0.07), or Air Force (p=0.07). There was no significant change in the number of surgeries performed at the four highest volume centers (p=0.23). There was a significant decrease in the number of biliary surgeries performed (p<0.01).

Procedure	2014	2015	2016	2017	2018	2019	2020	Total (%)
Hepatotomy	2	9	3	2	2	2	4	24 (2.2)
Liver wedge resection	21	21	23	31	25	21	8	150 (13.8)
Partial liver lobectomy	6	23	23	27	17	28	18	142 (13.1)
Trisegmentectomy/ extensive removal of liver	1	2	5	2	0	2	2	14 (1.3)
Total left lobe resection	3	6	1	3	1	0	1	15 (1.4)
Total right lobe resection	1	4	4	4	0	1	2	16 (1.5)
Allotransplant of liver	0	0	0	0	0	0	0	0 (0)
Surgery for liver lesion	2	0	2	2	2	0	0	8 (0.7)
Repair liver wound	10	8	12	20	16	17	16	99 (9.1)
Laparoscopic ablation of liver tumor with RFA	2	0	3	2	1	0	0	8 (0.7)
Laparoscopic ablation of liver tumor with cryotherapy	0	1	0	0	0	1	0	2 (0.2)
Unlisted laparoscopic procedure, liver	54	88	66	44	51	60	65	428 (39.4)
Open ablation of liver tumor with RFA	1	0	1	0	1	0	0	3 (0.3)
Open ablation of liver with cryotherapy	0	0	0	0	0	0	0	0 (0)
Liver surgery procedure	6	8	8	4	9	7	12	54 (5.0)
Incision of bile duct	6	10	6	2	4	1	3	32 (2.9)
Incise bile duct sphincter	4	1	0	0	0	0	0	5 (0.5)
Incision of liver duct	0	0	2	0	2	1	0	5 (0.5)
Bile duct revision	0	1	0	0	0	0	0	1 (0.1)
Excision of bile duct tumor	0	0	0	0	0	1	0	1 (0.1)
Excision of bile duct cyst	3	2	1	2	0	1	0	9 (0.8)
Fuse bile ducts and bowel	6	8	6	4	1	4	1	30 (2.8)
Hepaticojejunostomy	1	0	0	1	0	0	0	2 (0.2)
Reconstruction of bile ducts	1	0	0	0	0	0	0	1 (0.1)
Suture bile duct injury	0	0	0	0	1	0	0	1 (0.1)
Bile leak repair	10	8	5	7	1	4	2	37 (3.4)
Totals (%)	**140**	**200**	**171**	**157**	**134**	**151**	**134**	**1,087**





Disclaimer: The opinions and assertions contained herein are those of the authors and do not reflect those of Dwight D. Eisenhower Army Medical Center or the Department of Defense.

Facility	2014	2015	2016	2017	2018	2019	2020	Total (%)
ARMY	**87**	**120**	**115**	**100**	**86**	**118**	**92**	**720 (66.2)**
Brooke Army Military Medical Center	40	48	36	40	32	58	33	287 (26.4)
Madigan Army Medical Center	14	25	26	17	8	9	9	108 (9.9)
Other	33	47	55	43	46	51	50	325 (29.9)
NAVY	**34**	**47**	**23**	**22**	**18**	**18**	**22**	**186 (17.1)**
Naval Medical Center Portsmouth	19	22	7	9	7	7	8	79 (7.2)
Other	15	25	16	13	11	11	16	107 (9.8)
AIR FORCE	**16**	**23**	**26**	**22**	**13**	**12**	**5**	**118 (10.9)**
JOINT	**3**	**5**	**7**	**13**	**17**	**3**	**15**	**63 (5.8)**
Walter Reed National Military Medical Center	0	5	7	12	13	3	15	55 (5.1)
Other	3	0	0	1	4	0	0	8 (0.7)
Totals	**140**	**200**	**171**	**157**	**134**	**151**	**134**	**1087**

Conclusions: The number of hepatobiliary surgeries performed in military hospitals has not significantly decreased over the years 2014-2020, however there may be a trend of centralization within the military despite no formal protocol. Centralization to high volume centers outside the military would have a significant impact on military residency training and readiness without developing formal training agreements with civilian centers.

References:

1. Finks JF, Osborne NH, Birkmeyer JD. Trends in hospital volume and operative mortality for high-risk surgery. N Engl J Med. 2011;364(22):2128-37.
2. Franchi E, Donadon M, Torzilli G. Effects of volume on outcome in hepatobiliary surgery: a review with guidelines proposal. Glob Health Med. 2020;2(5):292-7.
3. Nathan H, Cameron JL, Choti MA, Schulick RD, Pawlik TM. The volume-outcomes effect in hepato-pancreato-biliary surgery: hospital versus surgeon contributions and specificity of the relationship. J Am Coll Surg. 2009;208(4):528-38.
4. Chen Q, Olsen G, Bagante F, Merath K, Idrees JJ, Akgul O, et al. Procedure-Specific Volume and Nurse-to-Patient Ratio: Implications for Failure to Rescue Patients Following Liver Surgery. World J Surg. 2019;43(3):910-9.
5. Vonlanthen R, Lodge P, Barkun JS, Farges O, Rogiers X, Soreide K, et al. Toward a Consensus on Centralization in Surgery. Ann Surg. 2018;268(5):712-24.
6. Morche J, Mathes T, Pieper D. Relationship between surgeon volume and outcomes: a systematic review of systematic reviews. Syst Rev. 2016;5(1):204.
7. Torzilli G, Viganò L, Giuliante F, Pinna AD. Liver surgery in Italy. Criteria to identify the hospital units and the tertiary referral centers entitled to perform it. Updates Surg. 2016;68(2):135-42.
8. Leoni J, Rougemont AL, Calinescu AM, Ansari M, Compagnon P, Wilde JCH, et al. Effect of Centralization on Surgical Outcome of Children Operated for Liver Tumors in Switzerland: A Retrospective Comparative Study. Children (Basel). 2022;9(2).
9. Choti MA, Bowman HM, Pitt HA, Sosa JA, Sitzmann JV, Cameron JL, et al. Should hepatic resections be performed at high-volume referral centers? J Gastrointest Surg. 1998;2(1):11-20.
10. Yasunaga H, Horiguchi H, Matsuda S, Fushimi K, Hashimoto H, Ohe K, et al. Relationship between hospital volume and operative mortality for liver resection: Data from the Japanese Diagnosis Procedure Combination database. Hepatol Res. 2012;42(11):1073-80.
11. Gani F, Pawlik TM. Assessing the Costs Associated with Volume-Based Referral for Hepatic Surgery. J Gastrointest Surg. 2016;20(5):945-52.
12. Chang CM, Yin WY, Wei CK, Lee CH, Lee CC. The combined effects of hospital and surgeon volume on short-term survival after hepatic resection in a population-based study. PLoS One. 2014;9(1):e86444.
13. Diaz A, Schoenbrunner A, Dillhoff M, Cloyd JM, Ejaz A, Tsung A, et al. Complex hepato-pancreato-biliary caseload during general surgery residency training: are we adequately training the next generation? HPB (Oxford). 2020;22(4):603-10.
14. Dalton MK, Remick KN, Mathias M, Trinh QD, Cooper Z, Elster EA, et al. Analysis of Surgical Volume in Military Medical Treatment Facilities and Clinical Combat Readiness of US Military Surgeons. JAMA Surg. 2022;157(1):43-50.
15. Haag A, Cone EB, Wun J, Herzog P, Lyon S, Nabi J, et al. Trends in Surgical Volume in the Military Health System-A Potential Threat to Mission Readiness. Mil Med. 2021;186(7-8):646-50.